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SARGENT'S STUDIES OF THE FORESTS OF JAPAN.

BY CHARLES E. BESSEY.

Within a few years we have had a most valuable contribution to our knowledge of the forest trees of Japan from the hand of Professor Charles S. Sargent, who first published a series of papers in *Garden and Forest*, now collected into a volume entitled the "Forest Flora of Japan." Some of the results of these studies are so at variance with the common statements in papers and books on the geographical distribution of plants as to be quite startling. Thus it is shown that many of the trees usually regarded as Japanese are not actually natives of the islands, but have been introduced from China and other adjacent regions. In discussing this point, reference is made to Dr. Gray's paper on "Forest Geography and Archæology," in which it was shown that Japan is remarkable for the number of species of its forest trees (one hundred and sixty-eight).

"In the Japanese enumeration were included, however, a number of trees which are not indigenous to Japan, but which, as we know, were long ago brought into the Empire from China and Corea, like most of the plants cultivated by the

Japanese. Early European travellers in Japan, like Thunberg and Siebold, who were unable to penetrate far into the interior, finding a number of plants common in cultivation, naturally believed them to be indigenous, and several Chinese plants were first described from individuals cultivated in Japanese gardens. Later writers on the Japanese flora have generally followed the example of the early travellers, and included these plants in the flora of Japan. Indeed, it is only very recently that it has been possible to travel freely in all parts of the Empire, and to study satisfactorily the character and distribution of its flora."

"The list of Chinese and Korean trees cultivated in Japan, and usually enumerated in floras of the Empire, includes *Magnolia conspicua*, *Magnolia parviflora*, *Magnolia watsonii*, *Sterculia platanifolia*, *Cedrela sinensis*, *Zizyphus vulgaris*, *Koelreuteria paniculata*, *Sapindus mukorosi*, *Acer trifidum*, *Rhus vernicifera*, *Sophora japonica*, *Liquidambar formosana* (*maximowiczii*), *Cornus officinalis*, *Diospyros kaki*, and probably *Diospyros lotus*, *Chionanthus retusa*, *Paulownia imperialis*, *Catalpa ovata*, *Lindera strychnifolia*, *Ulmus parvifolia*, *Thuya orientalis*, *Ginkgo biloba*, *Podocarpus nageia*, *Podocarpus macrophylla* and *Pinus koraiensis*."

In comparing the forests of Japan with those of other countries, after deducting the foregoing, it is still found that "the Japanese region for its area is unsurpassed in the number of trees which inhabit its forests." Comparing the Japanese forests with those of eastern North America, there are 139 species in 53 genera in the former, and 155 species in 66 genera in the latter. If now we take larger areas in each region, the comparison is equally instructive.

"In eastern North America, that is, in the whole region north of Mexico and east of the treeless plateau of the centre of the Continent, but exclusive of south Florida, 225 species of trees, divided among 134 genera, are now known. The Japan-Manchurian region includes eastern Manchuria, the Kurile Islands, Saghalin, and the four great Japanese islands, but, for our purpose, does not include the Loochoo group, which, although it forms a part of the Japanese Empire politically, is

tropical and subtropical in the character of its vegetation, which, moreover, is still imperfectly understood. In this narrow eastern border of Asia, there are now known 241 trees, divided among 99 genera. The extra Japanese portion of the region contributes but little to the enumeration. In Saghalin, Fr. Schmidt found only three trees which do not inhabit Yezo, and in Manchuria, according to Maximowicz and Schmidt, there are only eighteen trees which do not also occur in Saghalin or the northern Japanese islands. In the four islands of Yezo, Hondo, Shikoku, and Kyūshū, therefore, we now find 220 trees divided among ninety-nine genera, or only five less than occur in the immense territory which extends from Labrador to the Rio Grande, and from the shores of the Atlantic to the eastern base of the Rocky Mountains. Neither *Cycas revoluta* nor *Trachycarpus* (*Chamaerops*) *excelsa* is included in the Japanese list, as the best observers appear to agree in thinking that these two familiar plants are not indigenous to Japan proper. I have omitted, moreover, a few doubtful species from the Japan enumeration, like *Fagus japonica* Maximowicz and *Abies umbellata* Mayr, of which I could learn nothing in Japan, so that it is more probable that the number of Japanese trees will be increased than that any addition will be made to the silva of eastern America."

That the moist and equable climate of Japan is favorable to the growth of woody plants, is shown by the fact that very nearly ten per cent. of the species of Anthophytes and Pteridophytes are trees. If we consider the shrubs also, the proportion of ligneous species is still more remarkable, being almost exactly twenty-two per cent.

"The aggregation of arborescent species in Japan is, however, the most striking feature in the silva of that country. This is most noticeable in Yezo, where probably more species of trees are growing naturally in a small area than in any other one place outside the tropics, with the exception of the lower basin of the Ohio River, where, on a few acres in southern Indiana, Professor Robert Ridgway has counted no less than seventy-five arborescent species in thirty-six genera. Near Sapporo, the capital of the island, in ascending a hill which

rises only 500 feet above the level of the ocean, I noticed forty-six species and varieties of trees. Within five miles of this hill also grow sixty-two species and varieties, or more than a quarter of all the trees of the Empire, which are crowded into an area a few miles square, in the latitude of northern New England, in which, north of Cape Cod, there are only about the same number of trees."

Upon the question of the similarity of the flora of Japan to that of eastern North America, Professor Sargent makes a full discussion, and it is not too much to say that it will compel a change in some of the prevalent notions as to the vegetation of these regions.

"Travellers in Japan have often insisted on the resemblance between that country and eastern America in the general features of vegetation. But, with the exception of Yezo, which is still mostly uninhabited and in a state of nature, and those portions of the other islands which are over 5,000 feet above the level of the ocean, it is difficult to form a sufficiently accurate idea of the general appearance of the original forest-covering of Japan to be able to compare the aspects of its vegetation with those of any other country, for every foot of the lowlands and mountain valleys of the three southern islands has been cultivated for centuries. And the foothills and low mountains which were once clothed with forests, and could be again, are now covered with coarse herbage, principally *Eulalia*, and are destitute of trees, except such as have sprung up in sheltered ravines, and have succeeded in escaping the fires which are set every year to burn off the dry grasses. Remoteness, bad roads, and the impossibility of bringing down their timber into the valleys, have saved the mountain forests of Japan, which may still be seen, especially between 5,000 and 8,000 feet above the level of the sea, in their natural condition. But these elevated forests are composed of comparatively few species, and if it were not for the plantations of conifers, which the Japanese for at least twelve centuries, it is said, have been making to supply their workers in wood with material, and for the trees preserved or planted in the temple grounds in the neighborhood of towns, it would be impossible to obtain any

idea at all of many of the Japanese trees. But, fortunately, for nearly two thousand years the priests of Buddha have planted and replanted trees about their temples, which are often surrounded by what now appear to be natural woods, as no tree is ever cut and no attempt is made to clear up the undergrowth. These groves are sometimes of considerable extent, and contain noble trees, Japanese and Chinese, which give some idea of what the inhabitants of the forests of Japan were before the land was cleared for agriculture.

The floras of Japan and eastern America have, it is true, some curious features in common, and the presence in the two regions of certain types not found elsewhere shows their relationship. But these plants are usually small, and are rare or grow only on the high mountains. *Diphylleia*, *Buckleya*, *Epigaea*, and *Shortia* show the common origin of the two floras; but these are rare plants in Japan, as they are in America, with the exception of *Epigaea*, and probably not one traveller in ten thousand has ever seen them, while the chief elements of the forest flora of northern Japan, the only part of the Empire where, as has already been said, comparison is possible—those which all travellers notice—do not recall America so much, perhaps, as they do Siberia and Europe.”

On making a close comparison of the forests of Japan and eastern North America, it is found that in the former region there is no Black Oak, Chestnut Oak, Tulip-tree, Pawpaw, *Gordonia*, Plum-tree, Locust, *Gymnocladus*, *Liquidambar*, *Tupelo*, Osage Orange, *Sassafras*, Plane-tree or Hickory. Moreover, in many instances where a genus has representatives in both regions, the species are rather of the European than the North American type. The Japanese forests contain species of many genera which have no North American representatives, as *Euptelea*, *Cercidiphyllum*, *Trochodendron*, *Idesia*, *Ternstroemia*, *Cleyera*, *Eurya*, *Camellia*, *Phellodendron*, *Hovenia*, *Euscaphis*, *Maaackia*, *Albizzia*, *Distylium*, *Acanthopanax*, *Syringa*, *Cinnamomum*, *Machilus*, *Actinodaphne*, etc., etc. *Magnolia* and *Aesculus* occur in both regions, as also *Rhus*, *Hamamelis*, *Aralia*, *Cornus*, *Juglans*, *Thuya*, *Chamæcyparis*, *Picea*, *Abies* and *Tumion* (*Torreya*).

Other interesting comparisons are made by Professor Sargent showing that in other ways the forests of the two regions are quite unlike, as in the greater number of broad-leaved evergreen trees and shrubs in Japan, the small number of pines, and more striking still, the dense bamboo undergrowth which covers the forest floor, even on the mountains and in the extreme north.

Of the studies of the families of forest trees taken up by the author, it is impossible here to give more than a brief outline, and the reader must be referred to the work itself for the details. Of the *Magnolia* family there are, in Japan, five genera, while in the United States there are but four; nor are there any evergreen species of the genus *Magnolia*, resembling those of our southern States. In this family the most important tree is the *Cercidiphyllum japonicum*, which is said to be the largest tree in Japan. It is often one hundred feet high, and its usually clustered stems are often eight or ten feet in diameter at their common base.

Of *Ilex latifolia*, one of the eight arboreal species of hollies, Professor Sargent says that it is "probably the handsomest broad-leaved evergreen tree that grows in the forests of Japan, not only on account of its brilliant, abundant fruit, but also on account of the size and character of its foliage." We are told that it will certainly succeed in our southern States, and may be hardy as far north as Washington.

There are twenty species of Japanese Maples, more than twice as many as occur in North America. Two of these belong to the section *Negundo*. In marked contrast to the Maple family is the Pea family, represented by but three arborescent species, viz.: *Albizia julibrissin*, *Maackia amurensis* and *Gleditschia japonica*; the latter closely resembles our Honey Locust, even to the appearance of the branches, which are "horribly armed with flattened spines, two or three inches in length." *Fraxinus manchurica*, the Japanese Ash, attains a height of one hundred feet, with a diameter of from three to four feet. It has been grown for many years in the Arnold Arboretum, where it is quite hardy. The Japanese Elms are of minor importance, the principal species being identical with

the Elm of Europe (*Ulmus campestris*), although of much smaller growth. Related to the Elm is the Zelkova, "perhaps the largest deciduous-leaved tree of Japan," as well as "its most valuable timber tree." It attains a height of one hundred feet, and a diameter of eight to ten feet. The best known of the Japanese Oaks is *Quercus dentata*, a tall but irregular tree, "remarkable for the great size of its leaves, which are often a foot long and eight inches broad." *Quercus crispula* and *Quercus grosseserrata* are excellent timber trees, eighty to a hundred feet in height, with a diameter of three to four feet. The Chestnut and Beech are identical specifically with the European trees, but show varietal differences, the former being a more precocious tree, often bearing fruit when but ten or twelve feet in height. Professor Sargent suggests this tree for introduction into the northern United States.

Japan is richer than eastern North America in conifers, and they "are more planted for shade and ornament than they are in America, or, perhaps, in any other country." The great number of Japanese conifers prevents more than a mere mention in this paper of the most important species. *Chamaecyparis obtusa* and *Cryptomeria japonica* are largely planted as timber trees, the former also being one of the sacred trees planted about the temples. *Cephalotaxus drupacea* and *Ginkgo biloba* are common, although it is now agreed that the latter is not a native of Japan, where, however, it grows to a great height (100 feet) in the groves about the Buddhist temples. *Tumion* (*Torreya*) *nuciferum* is the "largest and most beautiful representative" of a curious genus. The Umbrella Pine—*Sciadopitys verticillata*—well-known to us as a small tree in cultivation, is, in its native region, a tall pyramidal tree a hundred feet or so in height. But two pines, *Pinus densiflora* and *Pinus thunbergii* are valuable timber trees. There are also important species of *Picea*, *Tsuga*, *Abies* and *Larix*, some of which have long been in cultivation in America and Europe.

In closing his interesting account of the Japanese forests, Professor Sargent remarks upon their lack of economic or scientific management, and the imperative need of adopting an intelligent system of reforestation and cultivation. It ap-

pears, however, that "the forests of Yezo are still intact, except where here and there a struggling settlement has broken into the forest blanket which covers this noble island. Here are great supplies of oak and ash of the best quality, of *cercidiphyllum*, walnut, fir, *acanthopanax*, cherry and birch—a storehouse of forest wealth, which, if properly managed, could be drawn upon for all time, and which, if the timber is not needed in Japan, may become, when the trans-Asiatic railroad is finished, an important factor in the development of southern Siberia and some of the treeless countries of central Asia."

THE BIRDS OF NEW GUINEA. (MISCELLANEOUS).

BY G. S. MEAD.

In considering the birds of the tropics or of any portion of the tropics, one is apt to suppose that the birds which are seen therein at any time may be seen at all times. In other words that they are as much fixtures as the trees, that they never migrate. While this may be true of a large number of species, it is not by any means true of every species, even of land birds.

Our own birds are with us a few months only; most of them at the approach of winter go south where, in tropical lands or in low temperate latitudes, they may be found during a longer period. The mere migrants—those that pause on their way north or south for days only—are not taken into account.

It is well then to bear in mind two facts: First, that in every country migratory birds whose period of stay covers a large proportion of the year, are to be met with besides permanent residents; second, that all birds found by travellers are not necessarily permanent residents, but in many instances transient visitors only.

Birds of Paradise are said to move from one island of the Papuan Archipelago to another, in order to avoid storms or stress of weather at certain times of the year. The Nicobar